6th Grade Mathematics

2015-2016 Curriculum Map

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Curriculum and Instruction
Tacoma Public Schools
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Common Core State Standards Course Description

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

Critical Area 1: Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

Critical Area 2: Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

Critical Area 3: Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

Critical Area 4: Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Critical Area 5: Students will make sense of negative and positive integers on vertical and horizontal numbers lines. Students will make sense of zero pairs as points that are equidistant from zero. Students will build on their understanding of addition and subtraction of whole numbers and positive rational numbers to develop an understanding of addition and subtraction of integers. The will understand

subtraction as the absolute value of the distance between two points on a number line.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

***Source**: Common Core State Standards for Mathematics*

Curriculum Guide Unit Overview

	Unit	Description	Estimated Time
First Semester	1: Ratios and Unit Rates	Students begin their sixth grade year investigating the concepts of ratio and rate. They use multiple forms of ratio language and ratio notation, and formalize understanding of equivalent ratios. Students apply reasoning when solving collections of ratio problems in real world contexts using various tools (e.g., tape diagrams, double number line diagrams, tables, equations and graphs). Students bridge their understanding of ratios to the value of a ratio, and then to rate and unit rate, discovering that a percent of a quantity is a rate per 100. The 27 day Unit concludes with students expressing a fraction as a percent and finding a percent of a quantity in real world concepts, supporting their reasoning with familiar representations they used previously in the Unit.	27 instructional days 2 assessment days
	2: Arithmetic Operations Including Dividing by a Fraction	In Unit 1, students used their existing understanding of multiplication and division as they began their study of ratios and rates. In Unit 2, students complete their understanding of the four operations as they study division of whole numbers, division by a fraction and operations on multi-digit decimals. This expanded understanding serves to complete their study of the four operations with positive rational numbers, thereby preparing students for understanding, locating, and ordering negative rational numbers (Unit 3) and algebraic expressions (Unit 4).	15 Instructional days 2 Assessment days
	3: Rational Numbers, Including Operations with Integers	Students are familiar with the number line and determining the location of positive fractions, decimals, and whole numbers from previous grades. Students extend the number line (both horizontally and vertically) in Unit 3 to include the opposites of whole numbers. The number line serves as a model to relate integers and other rational numbers to statements of order in real-world contexts. In this Unit's final topic, the number line model is extended to two-dimensions, as students use the coordinate plane to model and solve real-world problems involving rational numbers. Students formed a conceptual understanding of integers through the use of the number line, absolute value, and opposites and extended their understanding to include the ordering and comparing of rational numbers. This Unit uses the Integer Game: a card game that creates a conceptual understanding of integer operations and serves as a powerful mental model students can rely on during the Unit.	21 Instructional days 2 Assessment days
Second Semester	4 : Expressions and Equations	In Unit 4, Expressions and Equations, students extend their arithmetic work to include using letters to represent numbers in order to understand that letters are simply "stand-ins" for numbers and that arithmetic is carried out exactly as it is with numbers. Students explore operations in terms of verbal expressions and determine that arithmetic properties hold true with expressions because nothing has changed—they are still doing arithmetic with numbers. Students determine that letters are used to represent specific but unknown numbers and are used to make statements or identities that are true for all numbers or a range of numbers. They understand the relationships of operations and use them to generate equivalent expressions, ultimately extending arithmetic properties from manipulating numbers to manipulating expressions. Students read, write and evaluate expressions in order to develop and evaluate formulas. From there, they move to the study of true and false number sentences, where students conclude that solving an equation is the process of determining the number(s) that, when substituted for the variable, result in a true sentence. They conclude the Unit using arithmetic properties, identities, bar models, and finally algebra to solve one-step, two-step, and multi-step equations.	30 Instructional Days 3Assessment Days

	5: Area, Surface Area, and Volume	In this Unit, students utilize their previous experiences in order to understand and develop formulas for area, volume, and surface area. Students use composition and decomposition to determine the area of triangles, quadrilaterals, and other polygons. Extending skills from unit 3 where they used coordinates and absolute value to find distances between points on a coordinate plane, students determine distance, perimeter, and area on the coordinate plane in real-world contexts. Next in the unit comes real-life application of the volume formula where students extend the notion that volume is additive and find the volume of composite solid figures. They apply volume formulas and use their previous experience with solving equations to find missing volumes and missing dimensions. The final topic includes deconstructing the faces of solid figures to determine surface area. To wrap up the unit, students apply the surface area formula to real-life contexts and distinguish between the need to find surface area or volume within contextual situations.	**14 instructional days** **2 assessment days**
	6: Statistics	In this Unit, students move from simply representing data into analysis of data. Students begin to think and reason statistically, first by recognizing a statistical question as one that can be answered by collecting data. Students learn that the data collected to answer a statistical question has a distribution that is often summarized in terms of center, variability, and shape. Throughout the Unit, students see and represent data distributions using dot plots and histograms. They study quantitative ways to summarize numerical data sets in relation to their context and to the shape of the distribution. As the Unit ends, students synthesize what they have learned as they connect the graphical, verbal, and numerical summaries to each other within situational contexts, culminating with a major project.	**14 instructional days** **2 assessment days**
Post SBAC	**7: Probability and statistics**	In this Unit, students begin their study of probability, learning how to interpret probabilities and how to compute probabilities in simple settings. They also learn how to estimate probabilities empirically. Probability provides a foundation for the inferential reasoning developed in the second half of this Unit. Additionally, students build on their knowledge of data distributions that they studied earlier in Grade 6, compare data distributions of two or more populations, and are introduced to the idea of drawing informal inferences based on data from random samples.	**13 instructional days** **2 assessment days**

A conceptual story line for 6th Grade

First Semester

- Use ratio language to describe a ratio relationship between two quantities.
- Use ratio and rate reasoning to solve real-world and mathematical problems.
- Use unit rate (a/b associated with a ratio a:b where b ≠ 0) language in the context of a ratio relationships.
- Use ratio and rate reasoning to solve real-world and mathematical problems.
- Find a percent of a quantity as a rate per 100.
- Understand ratio concepts and use ratio reasoning to solve problems.
- Apply and extend previous understandings of multiplication and division to divide fractions by fractions
- Divide multi-digit numbers.
- Add, subtract, multiply, and divide multi-digit decimals.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values.
- Use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- Understand ordering and absolute value of rational numbers.
- Using the number line to model addition and subtraction of integers.
- Understanding and developing rules for multiplying and dividing integers.
- Add and subtract positive and negative numbers.
- Multiply and divide positive and negative numbers.
- Solve real-world problems by graphing in all four quadrant.
- Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
- Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
- Write and evaluate numerical expressions involving whole-number exponents.
- Write, read, and evaluate expressions in which letters stand for numbers.
- Apply the properties of operations to generate equivalent expressions.
- Identify when two expressions are equivalent.
- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems.

2nd Semester

- Reason about and solve one-variable equations and inequalities.
- Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
- Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.
- Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions.
- Represent and analyze quantitative relationships between dependent and independent variables.
- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the

appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism.

- Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems
- Draw and determine the area of a polygon on a coordinate plane.
- Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
- Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape.
- Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
- Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- Summarize numerical data sets in relation to their context.

End of year (Post SBAC)

- Understand that probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.
- Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long run relative frequency.
- Develop a probability model and use it to find probabilities of events.
- Find probabilities of compound events using organized lists, tables, tree diagrams and simulation.
- Understand that statistics can be used to gain information about a population by examining a sample of population.
- Use data from random sample to draw inferences about a population with an unknown characteristic of interest.
- Informally assess the degree of visual overlap of two numerical data distributions with similar variability.
- Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

A Conceptual Storyline for 6th Grade – First Semester

Ratios and Unit Rates (Unit 1)

- Use ratio language to describe a ratio relationship between two quantities
- Use ratio and rate reasoning to solve real-world and mathematical problems.
- Use unit rate (a/b associated with a ratio a:b where b ≠ 0) language in the context of a ratio relationships
- Use ratio and rate reasoning to solve real-world and mathematical problems.
- Find a percent of a quantity as a rate per 100.
- Understand ratio concepts and use ratio reasoning to solve problems.

Arithmetic operations including dividing by a fraction (Unit 2)

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions
- Divide multi-digit numbers
- Add, subtract, multiply, and divide multi-digit decimals
- Compute fluently with multi-digit numbers and find common factors and multiples
- Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor

Rational numbers, including operations with integers (Unit 3)

- Understand that positive and negative numbers are used together to describe quantities having opposite directions or values
- Use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- Understand ordering and absolute value of rational numbers.
- Using the number line to model addition and subtraction of integers.
- Understanding and developing rules for multiplying and dividing integers.
- Add and subtract positive and negative numbers.
- Multiply and divide positive and negative numbers.
- Solve real-world problems by graphing in all four quadrant
- Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
- Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems

Expressions (Unit 4)

- Write and evaluate numerical expressions involving whole-number exponents.
- Write, read, and evaluate expressions in which letters stand for numbers.
- Apply the properties of operations to generate equivalent expressions.
- Identify when two expressions are equivalent
- Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems.

A Conceptual Storyline for 6th Grade – Second Semester

Equations (Unit 4)

- Reason about and solve one-variable equations and inequalities.
- Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true?
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
- Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers.
- Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions
- Represent and analyze quantitative relationships between dependent and independent variables.

Area, surface area, and volume (Unit 5)

- Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism
- Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems
- Draw and determine the area of a polygon on a coordinate plane.

Statistics (Unit 6)

- Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
- Understand that a set of data collected to answer a statistical question has a distribution that can be described by its center, spread, and overall shape.
- Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
- Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- Summarize numerical data sets in relation to their context.

Probability and statistics (Unit 7; 7th grade Unit 5)

- Understand that probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring
- Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long run relative frequency
- Develop a probability model and use it to find probabilities of events
- Find probabilities of compound events using organized lists, tables, tree diagrams and simulation.
- Understand that statistics can be used to gain information about a population by examining a sample of population.
- Use data from random sample to draw inferences about a population with an unknown characteristic of interest.
- Informally assess the degree of visual overlap of two numerical data distributions with similar variability.
- Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

Unit 1 – Ratios and Unit Rates
Time Line 29 days (including assessments)

Students begin their sixth grade year investigating the concepts of ratio and rate. They use multiple forms of ratio language and ratio notation, and formalize understanding of equivalent ratios. Students apply reasoning when solving collections of ratio problems in real world contexts using various tools (e.g., tape diagrams, double number line diagrams, tables, equations and graphs). Students bridge their understanding of ratios to the value of a ratio, and then to rate and unit rate, discovering that a percent of a quantity is a rate per 100. The 29 day Unit concludes with students expressing a fraction as a percent and finding a percent of a quantity in real world concepts, supporting their reasoning with familiar representations they used previously in the Unit.

Anchor Task:
6th grade Unit 1, Lesson 14 Problem Set #1 and #2

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
4.OA.2 serves as the conceptual foundation for understanding ratios as a multiplicative comparison of two or more numbers used in quantities or measurements **(6.RP.1).** Students develop fluidity in using multiple forms of ratio language and ratio notation. They construct viable arguments and communicate reasoning about ratio equivalence as they solve ratio problems in real world contexts **(6.RP.3).** As the first topic comes to a close, students develop a precise definition of the value of a ratio a:b, where b ≠ 0 as the value a/b, applying previous understanding of fraction as division **(5.NF.3).** They can then formalize their understanding of equivalent ratios as ratios having the same value.	**6.RP.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes." **6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **a.** Make tables of equivalent ratios relating quantities with whole-number measurements, find	**MP.1**-Student will make sense of ratios in real world and mathematical contexts. **MP.4/MP.5** – Students will model ratios with appropriate tools, such tables, tape diagrams, double number lines and/or equations. MP1-Student will make sense of ratios in real world and mathematical contexts. **MP.4/MP.5** – Students will model ratios with appropriate tools, such tables, tape diagrams, double number lines and/or equations.	• Students understand that a ratio is an ordered pair of non-negative numbers, which are not both zero. Students understand that a ratio is often used instead of describing the first number as a multiple of the second. • Students use the precise language and notation of ratios (e.g., 3:2, 3 to 2). Students understand that the order of the pair of numbers in a ratio matters and that the description of the ratio relationship determines the correct order of the numbers. Students conceive of real-world contextual situations to match a given ratio.	Topic A Lessons 1-8 Notes: Combine Lessons 1 and 2 in 1 day Lesson 5 and 6 can be done in 1 day Lesson 7 and 8 can be combined to be used as a 1 day lesson	

	missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.				
With the concept of ratio equivalence formally defined, students explore collections of equivalent ratios in real world contexts in Topic B. They build ratio tables and study their additive and multiplicative structure **(6.RP.3a).** Students continue to apply reasoning to solve ratio problems while they explore representations of collections of equivalent ratios and relate those representations to the ratio table **(6.RP.3)**. Building on their experience with number lines, students represent collections of equivalent ratios with a double number line model. They relate ratio tables to equations using the value of a ratio defined in Topic A. Finally, students expand their experience with the coordinate plane **(5.G.1, 5.G.2)** as they represent collections of equivalent ratios by plotting the pairs of values on the coordinate plane. The Mid-Unit Assessment follows Topic B.	**6.RP.3** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. **b.** Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? **d.** Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.		• Students understand that a ratio is often used to describe the relationship between the amount of one quantity and the amount of another quantity as in the cases of mixtures or constant rates. • Students understand that a ratio table is a table of equivalent ratios. Students use ratio tables to solve problems. • Students identify both the additive and multiplicative structure of a ratio table and use the structure to make additional entries in the table. • Students use ratio tables to solve problems. • Students solve problems by comparing different ratios using two or more ratio tables. • Students create equivalent ratios using a ratio table and represent these ratios on a double number line diagram. • Students extend and use a double number line diagram to solve ratio problems related to the	Topic B Lessons 9-15 Notes: Incorporate double number lines in lesson 9, if time. Emphasize the use of tables because the time invested now will help in later units.	Mid Unit Assessment after Topic B

			real world. • Students use the value of the ratio to problem-solve by writing and solving equations. • Students represent ratios in ratio tables, equations, and double number line diagrams and then represent those ratios in the coordinate plane.		
In Topic C, students build further on their understanding of ratios and the value of a ratio as they come to understand that a ratio of 5 miles to 2 hours corresponds to a rate of 2.5 miles per hour, where the unit rate is the numerical part of the rate, 2.5, and miles per hour is the newly formed unit of measurement of the rate **(6.RP.2).** Students solve unit rate problems involving unit pricing, constant speed, and constant rates of work **(6.RP.3b).** They apply their understanding of rates to situations in the real world. Students determine unit prices and use measurement conversions to comparison shop, and decontextualize constant speed and work situations to determine outcomes. Students combine their new understanding of rate to connect and revisit	**6.RP.2** Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger." 6.RP.3b 6.RP.3d Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. b. Solve unit rate problems including those involving unit pricing and constant speed. For example, if it		• Students recognize that they can associate a ratio of two quantities, such as the ratio of miles per hour is 5:2, to another quantity called the rate. • Given a ratio, students precisely identify the associated rate. They identify the unit rate and the rate unit. • Given a rate, students find ratios associated with the rate, including a ratio where the second term is one and a ratio where both terms are whole numbers. • Students recognize that all ratios associated to a given rate are equivalent because they have the same value. • While there is no physical way to divide two different quantities like (5 miles)/(2 hours), students make use of the structure of division and ratios to model (5 miles)/(2 hours) as a	Topic C Lessons 16-23 Notes: Students should be able to use unit rate language to interpret and describe the meaning of the unit rate. This seeds an important idea that comes in 8th grade and in Algebra. Lessons 16 and 17 can be combined if you feel that your students are able to do it in one day. Page 164 of the teacher manual (page S.92 of student manual) contains a list of conversion factors. Students should know these for	

concepts of converting among different-sized standard measurement units (**5.MD.1**). They then expand upon this background as they learn to manipulate and transform units when multiplying and dividing quantities **(6.RP.3d).**	took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.		quantity 2.5 mph. Interpreting a rate as a division of two quantities, or better yet a fraction, is the first step towards converting measurement units using rates later in the Unit, and dimensional analysis in high school. They use this interpretation of a rate in word problems when multiplying a rate by a quantity.	SBAC (remember: no formula sheet).	
In Topic D, students are introduced to percent and find percent of a quantity as a rate per 100. Students understand that N percent of a quantity has the same value as N/100 of that quantity. Students express a fraction as a percent, and find a percent of a quantity in real-world contexts. Students learn to express a ratio using the language of percent and to solve percent problems by selecting from familiar representations, such as tape diagrams and double number lines, or a combination of both **(6.RP.3c).** An End-of-Unit Assessment follows Topic D.	**6.RP.3c** Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.		• Students understand that percents are related to part-to-whole ratios and rates where the whole is 100. • Students model percents and write a percent as a fraction over 100 or a decimal to the hundredths place. • Students write a fraction and a decimal as a percent of a whole quantity and write a percent of whole quantity as fraction or decimal. • Students find the percent of a quantity. Given a part and the percent, students solve problems involving finding the whole. • Students find the percent of a quantity. Given a part and the percent, students solve problems involving finding the whole.	Topic D Lessons 24-29 Notes: Complete lessons 27-29 in 2 days. Stress the importance of the fraction bar symbolizing division operation. Anchor chart to show the four ways to write a division problem.	End of Unit Assessment after Topic D

			• Given a part and the percent, students find the percent of a quantity and solve problems involving finding the whole. • Students find the percent of a quantity. • Given a part and the percent, students solve problems involving finding the whole.		

Unit 2 – Multi-digit computation, dividing fractions and finding common factors and multiples
Time Line 17 days (including assessments)

Students build on their work in earlier grades in working with factors and multiples **(4.OA.B.4, 5.NF.B.4b)** as they formalize the concepts and uses of greatest common factor (including the distributive property) and least common multiple. Although students have learned all four operations with multi-digit whole numbers and decimals in earlier grades, in this unit they formalize the related standard algorithms as they build proficiency and fluency. This builds on students' Grade 5 work with dividing fractions by whole numbers and whole numbers by fractions as students investigate dividing fractions by fractions. This unit sets the stage for students' future work in finding unit rates involving ratios of fractions (**7.RP.A.1**).

Anchor Task:
6th grade, Unit 2, Mid-unit assessment task # 2a-c

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
In Topic A, students extend their previous understanding of multiplication and division to divide fractions by fractions. They construct division stories and solve word problems involving division of fractions **(6.NS.1)**. Through the context of word problems, students understand and use partitive division of fractions to determine how much is in each group. Students use measurement to determine quotients of fractions. They are presented conceptual problems where they determine that the quotient represents how many of the divisor is in the dividend. Students look for and uncover patterns while modeling quotients of fractions to ultimately discover the relationship between multiplication and division. Using this relationship, students create equations and formulas to represent and solve problems. Later in the	**6.NS.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.	**MP.1** Make sense of problems and persevere in solving them. Students use concrete representations when understanding the meaning of division and apply it to the division of fractions. **MP.2** Reason abstractly and quantitatively. Students make sense of quantities and their relationships in problems. **MP.6** Attend to Precision. Students use precise language and place value when adding, subtracting, multiplying, and dividing by multi-digit decimal numbers. **MP.7** Look for and make use of structure. Students find patterns and connections when multiplying and dividing multi-digit decimals.	•Students use visual models such as fraction bars, number lines, and area models to show the quotient of whole numbers and fractions. Students use the models to show the connection between those models and the multiplication of fractions. •Students divide a fraction by a whole number. •Students understand the difference between a whole number being divided by a fraction and a fraction being divided by a whole number. •Students use visual models such as fraction bars and area models to show the division of fractions by fractions with common denominators. •Students make connections to the multiplication of fractions. In addition, students understand that the division of fractions require students to ask, "How many groups of the divisor are in the dividend?" to get the quotient.	Topic A Lessons 1-8 Notes: Lessons 5 and 6 reinforce what was taught in lessons 1-4. Can combine 5 and 6 into a one day lesson. Before lesson 7 there should be a focus on the connection between the model and why you invert	

Unit, students learn to and apply the direct correlation of division of fractions to division of decimals.				and multiply.	
Prior to division of decimals, students will revisit all decimal operations in Topic B. Students have had extensive experience of decimal operations to the hundredths and thousandths **(5.NBT.7),** which prepares them to easily compute with more decimal places. They find that sums and differences of large mixed numbers can sometimes be more efficiently determined by first converting the number to a decimal and then applying the standard algorithms **(6.NS.3).** They use estimation to justify their answers. Within decimal multiplication, students begin to practice the distributive property. Students use arrays and partial products to understand and apply the distributive property as they solve multiplication problems involving decimals.	**6.NS.3** Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.		•Students make connections between visual models and multiplication of fractions. •Students demonstrate further understanding of division of fractions when they create their own word problems. •Students choose a measurement division problem, draw a model, find the answer, choose a unit, and then set up a situation. Further, they discover that they must try several situations and units before finding which are realistic with given numbers. •Students choose a partitive division problem, draw a model, find the answer, choose a unit, and then set up a situation. Further, they practice trying several situations and units before finding which are realistic with given numbers.	Topic B Lessons: 9-11 Notes: Lesson 9 is about estimating sums and differences of decimals. Lesson 11 focus instruction on the powers of 10 and in the improper fractions which will help kids discover how many decimal points to move the decimal points over.	Mid-Unit Assessment after topic B

In Grades 4 and 5, students used concrete models, pictorial representations, and properties to divide whole numbers **(4.NBT.6, 5.NBT.6).** They became efficient in applying the standard algorithm for long division. They broke dividends apart into like base-ten units, applying the distributive property to find quotients place by place. In Topic C, students connect estimation to place value and determine that the standard algorithm is simply a tally system arranged in place value columns **(6.NS.2).** Students understand that when they "bring down" the next digit in the algorithm, they are essentially distributing, recording, and shifting to the next place value. They understand that the steps in the algorithm continually provide better approximations to the answer. Students further their understanding of division as they develop fluency in the use of the standard algorithm to divide multi-digit decimals (6.NS.3). They make connections to division of fractions and rely on mental math strategies to implement the division algorithm when finding the quotients of decimals.	**6.NS.2** Fluently divide multi-digit numbers using the standard algorithm.		•Students divide fractions by mixed numbers by first converting the mixed numbers into a fraction with a value larger than one. •Students use equations to find quotients. •Students relate decimals to mixed numbers and round addends, minuends, and subtrahends to whole numbers in order to predict reasonable answers. •Students use their knowledge of adding and subtracting multi-digit numbers to find the sums and differences of decimals. •Students understand the importance of place value and solve problems in real-world contexts. •Through the use of arrays and partial products, students strategize and apply the distributive property to find the product of decimals.	Topic C Lesson 12-15 Notes: Take 3 days on the set of lessons 12-15. Combine 12 and 13 Lesson 15 Activity (Pass the paper) should be done as a station activity instead of the way described in the directions.	
In Topic D, students think logically about multiplicative arithmetic. Students apply odd	**6.NS.4** Find the greatest common factor of two whole numbers		• Students apply odd and even numbers to understand factors and	Topic D Lessons	End of Unit Assessment after Topic

and even number properties and divisibility rules to find factors and multiples. They extend this application to consider common factors and multiples and find greatest common factors and least common multiples.	less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100.		multiples. • Students apply divisibility rules, specifically for 3 and 9, to understand factors and multiples. • Students find the least common multiple and greatest common factor and apply factors to the Distributive Property.	16-18 Notes: Combine lessons 16 and 17. Make an anchor chart of the divisibility rules. Skip Lesson 19. Not needed for 6th grade students.	D

Unit 3 Rational Numbers Including Operations with Integers
Time Line 23 days (including assessments)

Students are familiar with the number line and determining the location of positive fractions, decimals, and whole numbers from previous grades. Students extend the number line (both horizontally and vertically) in Unit 3 to include the opposites of whole numbers. The number line serves as a model to relate integers and other rational numbers to statements of order in real-world contexts. In this Unit's final topic, the number line model is extended to two-dimensions, as students use the coordinate plane to model and solve real-world problems involving rational numbers. This Unit uses the Integer Game: a card game that creates a conceptual understanding of integer operations and serves as a powerful mental model students can rely on during the Unit. Students build on their understanding of integers to add, subtract, multiply, and divide signed numbers.

Anchor Task:
Grade 6, Unit 3, Mid-Unit assessment #3a-d
(Grade 7, Unit 2, Rational Numbers) Mid-Unit assessment #7a-c

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
Topic A focuses on the development of the number line in the opposite direction (to the left or below zero). Students use positive integers to locate negative integers, understanding that a number and its opposite will be on opposite sides of zero and that both lie the same distance from zero. Students represent the opposite of a positive number as a negative number and vice-versa. Students realize that zero is its own opposite and that the opposite of the opposite of a number is actually the number itself **(6.NS.C.6a).** They use positive and negative numbers to represent real-world quantities such as -50 to represent a $50 debt or 50 to represent a $50 deposit into a savings account **(6.NS.C.5).** Topic A concludes with students furthering their understanding of signed	**6.NS.C.5** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.	**MP.2** Reason abstractly and quantitatively. Students read a word problem involving integers, draw a number line or coordinate plane model, and write about their conclusions. They understand the meaning of quantities as they relate to the real world. For instance, a loss of 14 yards in a football game can be represented by -14, and a distance of 25 feet below sea level is greater than a distance of 5 feet above sea level because |-25|>|5|. Students decontextualize word problems related to distance by creating number lines and coordinate plane models. In doing so, they count the number of units between endpoints and use the concept of absolute value to justify their answer. For	• Students extend their understanding of the number line, which includes zero and numbers to the right, that are above zero, and numbers to the left, that are below zero. • Students use positive and negative numbers to indicate a change (gain or loss) in elevation with a fixed reference point, temperature, and the balance in a bank account. • Students know that the opposites of rational numbers are similar to the opposites of integers. Students know that two rational numbers have opposite signs if they are on different sides of zero, and that they have the same sign if they are on the same side of zero on the number line.	Topic A Lessons 1-6 Notes: None	

numbers to include the rational numbers. Students recognize that finding the opposite of any rational number is the same as finding an integer's opposite **(6.NS.C.6c)** and that two rational numbers that lie on the same side of zero will have the same sign, while those that lie on opposites sides of zero will have opposite signs.		instance, when given the coordinate (2,6), students determine that the point (2,-6) would be the same distance from the x-axis but in the opposite direction because both points have the same x-coordinate and their y-coordinates (6 and -6) have the same absolute value.			
In Topic B, students apply their understanding of a rational number's position on the number line (**6.NS.C.6c**) to order rational numbers. Students understand that when using a conventional horizontal number line, the numbers increase as you move along the line to the right and decrease as you move to the left. They recognize that if *a* and *b* are rational numbers and $a < b$, then it must be true that $-a > -b$. Students compare rational numbers using inequality symbols and words to state the relationship between two or more rational numbers. They describe the relationship between rational numbers in real-world situations and with respect to numbers' positions on the number line (**6.NS.C.7a**, **6.NS.C.7b**). For instance, students explain that -10° *F* is warmer than -11º *F* because -10 is to the right (or above) -11 on a number line and write -10° $F > -11$º *F*. Students use	**6.NS.C.6** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or	**MP.4** Model with mathematics. Students use vertical and horizontal number lines to visualize integers and better understand their connection to whole numbers. They divide number line intervals into sub-intervals of tenths to determine the correct placement of rational numbers. Students may represent a decimal as a fraction or a fraction as a decimal to better understand its relationship to other rational numbers to which it is being compared. To explain the meaning of a quantity in a real-life situation (involving elevation, temperature, or direction), students may draw a diagram and/or number line to illustrate the location of the quantity in relation to zero or an established level that represents zero in that situation.	• Students write, interpret, and explain statements of order for rational numbers in the real-world. • Students compare and interpret rational numbers' order on the number line, making statements that relate the numbers' location on the number line to their order. • Students write and explain inequality statements involving rational numbers. • Students justify inequality statements involving rational numbers. • Students understand the absolute value of a number as its distance from zero on the number line. • Students apply understanding of order and absolute value when examining real world	Topic B Lessons 7-13 Notes: 6th grade lessons 7-9 could be combined to be done in 2 days.	6th grade Mid-Unit Assessment after Topic B 7th grade mid-Unit Assessment (Integers) after 7th grade lessons

the concept of absolute value and its notation to show a number's distance from zero on the number line and recognize that opposite numbers have the same absolute value (**6.NS.C.7c**). In a real-world scenario, students interpret absolute value as magnitude for a positive or negative quantity. They apply their understanding of order and absolute value to determine that, for instance, a checking account balance that is less than -25 dollars represents a debt of more than $25 (**6.NS.C.7d**). This Unit uses the Integer Game: a card game that creates a conceptual understanding of integer operations and serves as a powerful mental model students can rely on during the Unit. Students build on their understanding of rational numbers to add, subtract, multiply, and divide signed numbers.	both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **6.NS.C.7** Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* *b.* Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.* *c.* Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-	**MP.6** Attend to precision. In representing signed numbers on a number line or as a quantity, students pay close attention to the direction and sign of a number. They realize that a negative number must lie to the left of zero on a horizontal number line or below zero on a vertical number line. They recognize that the way they represent their answer depends on the phrasing of a question and context of a word problem. For instance, a question that asks a student: "How many feet below sea level is the diver?" would require the answer to be stated as a positive number. Whereas, a question that is phrased: "Which integer would represent 40 feet below sea level?" would require the answer to be written as -40. **MP.7** Look for and make use of structure. Students understand the placement of negative numbers on a number line by observing the patterns that exist between negative and positive numbers with respect to zero. They recognize that two numbers are opposites if they are the same distance from zero and that zero is its own opposite. Students extend their understanding of the	scenarios. Students realize, for instance, that the depth of a location below sea level is the absolute value of a negative number, while the height of an object above sea level is the absolute value of a positive number. • Students understand the rules for adding integers: a. Add integers with the same sign by adding the absolute values and using the common sign. b. Add integers with opposite signs by subtracting the smaller absolute value from the larger absolute value and using the sign of the number with the larger absolute value. • Students know the definition of subtraction in terms of addition (i.e., $a - b = c$ means that $b + c = a$) and use the definition of subtraction to justify the distance formula. • Students explain that multiplying by a positive integer is repeated addition and that adding a number multiple times has the same effect as		

	world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* **7.NS.A.1** Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. **7.NS.A.2** Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.	number line's structure to the coordinate plane to determine a point's location. They recognize the relationship between the signs of a point's coordinates and the quadrant in which the point lies.	removing the opposite value the same number of times (e.g., 5 x 3 = (- 5) x (- 3) and 5 x (-3) = (-5) x 3.) • Students recognize that division is the reverse process of multiplication, and that integers can be divided provided the divisor is not zero. If p and q are integers, then $-(p/q) = -p/q = p/-q$		
In Topic C, students extend their understanding of the ordering of rational numbers in one dimension (on a number line) to the two-dimensional space of the coordinate	**6.NS.C.8** Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value		• Students use ordered pairs to name points in a grid and to locate points on a map. • Students extend their understanding of the	Topic C Lessons 14-19 Notes:	End of Unit Assessment after Topic C

plane. They construct the plane's vertical and horizontal axes, discovering the relationship between the four quadrants and the signs of the coordinates of points that lie in each quadrant (**6.NS.C.6b**, **6.NS.C.6c**). Students build upon their foundational understanding from 5th Grade (**5.G.1**, **5.G.2**) of plotting points in the first quadrant and transition to locating points in all four quadrants. Students apply the concept of absolute value to find the distance between points located on vertical or horizontal lines and solve real-world problems related to distance, segments, and shapes (**6.NS.C.8**).	to find distances between points with the same first coordinate or the same second coordinate.		coordinate plane to include all four quadrants, and recognize that the axes (identified as the -axis and -axis) of the coordinate plane divide the plane into four regions called quadrants (that are labeled from first to fourth and are denoted by Roman Numerals). • Given some points as ordered pairs, students make reasonable choices for scales on both axes, and locate and label the points on graph paper. • Students use the coordinate plane to graph points, line segments and geometric shapes in the various quadrants and then use the absolute value to find the related distances.	None AND 7th grade Unit 2 Lessons 1-16	

Unit 4 Expressions and Equations 33 days (including assessments)					
To begin this unit, students are introduced to important identities that will be useful in solving equations and developing proficiency with solving problems algebraically. In Topic A, students understand the relationships of operations and use them to generate equivalent expressions (6.EE.A.3). By this time, students have had ample experience with the four operations since they have worked with them from kindergarten through Grade 5 (**1.OA.B.3**, **3.OA.B.5**). The topic opens with the opportunity to clarify those relationships, providing students with the knowledge to build and evaluate identities that are important for solving equations. In this topic, students discover and work with the following identities: $w - x + x = w$, $w + x - x = w$, a divided by b times $b = a$, a times b divided by $b = a$ (when $b \neq 0$), and $3x = x + x + x$. Students will also discover that if 12 divided $x = 4$, then $12 - x - x - x - x = 0$.					
Anchor Task: 6th Grade, Unit 4, Mid-Unit Assessment #6a-b 6th Grade, Unit 4, End of Unit Assessment #1a-c					
Big Ideas	**Common Core State Standards**	**Standards for Mathematical Practice**	**Objectives**	**Engage Lessons**	**Assessments**
In Topic A, students further discover and clarify the relationships of the operations using models. From these models, students build and evaluate identities that are useful in solving equations and developing proficiency with solving problems algebraically. Students will use models to discover the relationship between addition and subtraction they will also model the relationship between multiplication and division.	**6.EE.3** Apply the properties of operations to generate equivalent expressions.	**MP.2** Reason abstractly and quantitatively. Students connect symbols to their numerical referents. **MP.6** Attend to Precision. Students are precise in defining variables. They understand that a variable represents one number.	• Students build and clarify the relationship of addition and subtraction by evaluating identities such as w - x + x = w and w + x - x = w. • Students build and clarify the relationship of multiplication and division by evaluating identities. • Students understand that a letter represents one number in an expression. When that number replaces the letter, the expression can be evaluated to one number.	Topic A Lessons 1-4 Notes: Lessons 1-4 completed over 3 days.	
In Topic B, students differentiate between the product of two numbers and whole numbers with exponents. They differentiate between the two through exploration of patterns, specifically noting	**6.EE.1** Write and evaluate numeric expressions involving whole-number exponents. **6.EE.2c** Write, read, and evaluate expressions in which letters stand for numbers. Evaluate	**MP.7** Look for and make use of structure. Students look for structure in expressions by deconstructing them into a sequence of operations. They make use of structure to interpret an expression's meaning in terms of the	• Students relate decimals to mixed numbers and round addends, minuends, and subtrahends to whole numbers in order to predict reasonable answers.	Topic B Lessons 5 and 6 Notes: Lesson 5 and 6 can be done in one day but potentially	

how squares grow from a 1×1 measure. They determine that a square with a length and width of three units in measure is constructed with nine square units.	expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).	quantities represented by the variables. In addition, students make use of structure by creating equivalent expressions using properties.	• Students use their knowledge of adding and subtracting multi-digit numbers to find the sums and differences of decimals. • Students understand the importance of place value and solve problems in real-world contexts.	allow an extra day of practice on Order of Operations. None	
Students begin substituting, or replacing, letters with numbers and numbers with letters in Topic C in order to evaluate expressions with a given number and to determine expressions to create identities. In Lesson 7, students replace letters with a given number in order to evaluate the expression to one number. They continue to practice with exponents in this lesson in order to determine the area of squares and rectangles as shown below.	**6.EE.4** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).]		• Students understand that a letter represents one number in an expression. When that number replaces the letter, the expression can be evaluated to one number.	Topic C Lessons 7 and 8 Notes: Complete Lessons 7 and 8 in one day.	
In Topic D, students formally utilize their understanding of expressions in order to expand, factor, and distribute.	**6.EE.2** Write, read, and evaluate expressions in which letters stand for numbers. **a.** Write expressions that record operations with numbers and with letters standing for numbers. For	**MP.8** Look for and express regularity in repeated reasoning. Students look for regularity in a repeated calculation and express it with a general formula. Students work with variable expressions while focusing	• Students write expressions that record addition and subtraction operations with numbers. • Students identify parts of an expression using mathematical terms for multiplication. They view	Topic D Lessons 9-14 Notes: None	

	example, express the calculation "Subtract y from 5" as 5-y. **b.** Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. **6.EE.A.3** Apply the properties of operations to generate equivalent expressions. **6.EE.A.4** Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).	more on the patterns that develop than the actual numbers that the variable represents.	one or more parts of an expression as a single entity. • Students model and write equivalent expressions using the distributive property. • They move from an expanded form to a factored form of an expression. • They move from a factored form to an expanded form of an expression. • Students write numerical expressions in two forms, dividend divided by divisor and dividend /divisor, and note the relationship between the two.		
In Topic E, students express mathematical terms in algebraic form. They read and write expressions in which letters stand for numbers.	**6.EE.2b** Write, read, and evaluate expressions in which letters stand for numbers. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.		• Students read expressions in which letters stand for numbers. They assign operation terms to operations when reading. • Students identify parts of an algebraic expression using mathematical terms for all operations. • Students write algebraic expressions that record all operations with numbers and letters standing for the numbers.	Topic E Lessons 15-17 Notes: None	Mid-Unit Assessment after Topic E
In Topic F, students demonstrate their	**6.EE.2c** Write, read, and evaluate expressions in		• Students use variables to write expressions	Topic F	

knowledge of expressions from previous topics in order to write and evaluate expressions and formulas. Students bridge their understanding of reading and writing expressions to substituting values in order to evaluate expressions.	which letters stand for numbers Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). Understand solving an equation or inequality as a process of answering a question; which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.		involving addition and subtraction from real-world problems. • Students evaluate these expressions when given the value of the variable. • Students develop expressions involving addition and subtraction from real-world problems. • Students evaluate these expressions for given values. • Students develop expressions involving multiplication and division from real-world problems. • Students evaluate these expressions for given values. • Students develop formulas involving multiplication and addition from real-world problems. • Students evaluate these formulas for given values.	Lessons 18-22 Notes: Spend 3 days completing lessons 18-22.	
In Topic G, students move from identifying true and false number sentences to making true number sentences false and false number sentences true. In Lesson 23, students explain what equality and inequality symbols represent. They determine if a number sentence is true or false based on the equality or inequality symbol.	**6.EE.5** Understand solving an equation or inequality as a process of answering a question; which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.6** Use variables to represent numbers and write expressions when		• Students explain what the equality and inequality symbols stand for. They determine if a number sentence is true or false based on the given symbol. • Students identify values for the variable in an equation and inequality that result in true number sentences. • Students identify values for the variable in an	Topic G Lessons 23-29 Notes: Lessons 28 and 29 are optional. Excellent problems but may go beyond 6th grade level.	

	solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.7** Solve real-world and mathematical problems by writing and solving equations in the form x+p=q and px=q for cases in which p, q and x are all nonnegative rational numbers.		equation and inequality that result in false number sentences. • Students solve one-step equations by relating an equation to a diagram. • Students check to determine if their solution makes the equation true. • Students calculate the solution of one-step equations by using their knowledge of order of operations and the properties of equality for addition, subtraction, multiplication, and division. Students employ tape diagrams to determine their answer. • Students use their knowledge of simplifying expressions, order of operations and properties of equality to calculate the solution of multi-step equations. Students use tables to determine their answer. •		
In Topic H, students apply their knowledge from the entire Unit to solve equations in real-world, contextual problems. Students use prior knowledge from Grade 4 to solve missing angle problems. Students write and solve one step equations in order to determine a missing angle. Students use	**6.EE.5** Understand solving an equation or inequality as a process of answering a question; which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **6.EE.6** Use variables to		• Students calculate missing angle measures by writing and solving equations. • Students analyze an equation in two variables to choose an independent variable and dependent variable. Students determine whether or not the equation is solved for the	Topic H Lessons 30-34 Notes: Lesson 32 is an important lesson as it introduces multiple representations.	End of Unit Assessment after Topic H

their prior knowledge from Unit 1 to contsruct tables of independent and dependent values in order to analyze equations with two variables from real-life contexts. They represent equations by plotting values from the tables on a coordinate grid.	represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **6.EE.7** Solve real-world and mathematical problems by writing and solving equations **6.EE.8** Write an inequality of the form x>c or x<c to represent a constraint or condition in a real-world mathematical problem. **6.EE.9** Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.		second variable in terms of the first variable or vice versa. • Students create a table by placing the independent variable in the first row or column and the dependent variable in the second row or column. They compute entries in the table by choosing arbitrary values for the independent variable (no constraints) and then determine what the dependent variable must be. • Students analyze an equation in two variables, choose an independent variable and a dependent variable, make a table and make a graph for the equation by plotting the points in the table. For the graph, the independent variable is usually represented by the horizontal axis and the dependent variable is usually represented by the vertical axis		

Unit 5 Area, Surface Area, and Volume
16 days (including assessments)

In this unit, students utilize their previous experiences in order to understand and develop formulas for area, volume, and surface area. Students use composition and decomposition to determine the area of triangles, quadrilaterals, and other polygons. Extending skills from Unit 3 where they used coordinates and absolute value to find distances between points on a coordinate plane, students determine distance, perimeter, and area on the coordinate plane in real-world contexts. Next in the unit comes real-life application of the volume formula where students extend the notion that volume is additive and find the volume of composite solid figures. They apply volume formulas and use their previous experience with solving equations to find missing volumes and missing dimensions. The final topic includes deconstructing the faces of solid figures to determine surface area. To wrap up the unit, students apply the surface area formula to real-life contexts and distinguish between the need to find surface area or volume within contextual situations.

Anchor Task:
Grade 6, Unit 5 End of Unit-Assessment #1a-c

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
In Topic A, students discover the area of triangles, quadrilaterals, and other polygons through composition and decomposition. Students discover through composition that the area of a parallelogram is the same as the area of a rectangle with the same base and height measurements. Students justify the area formula for a right triangle by viewing the right triangle as part of a rectangle composed of two right triangles. Students decompose triangles into right triangles and deconstruct triangles to discover that the area of a triangle is exactly one half the area of a parallelogram. Using known area formulas for rectangles, triangles, and parallelograms, students find area formulas for polygons by decomposing the regions into triangles, rectangles, and parallelograms.	**6.G.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.	**MP.1** Make sense of problems and persevere in solving them. Students make sense of real-world problems that involve area, volume, and surface area. **MP.3** Construct viable arguments and critique the reasoning of others. Students will develop different arguments as to why area formulas work for different polygons.	• Students show the area formula for the region bounded by a parallelogram by composing it into rectangles. They understand that the area of a parallelogram is the area of the region bounded by the parallelogram. • Students justify the area formula for a right triangle by viewing the right triangle as part of a rectangle composed of two right triangles. • Students show the area formula for a triangular region by decomposing a triangle into right triangles. • Students understand that the height of the triangle is the perpendicular segment from a vertex of a triangle to the line containing the opposite side. The opposite side is	Topic A Lessons 1-6 Notes: Combine lessons 1-4 to be completed as a 2 day lesson	

			called the base. • Students determine the area of composite figures in real-life contextual situations using composition and decomposition of polygons. • Students determine the area of a missing region using composition and decomposition of polygons. •		
In Lesson 7 of Topic B, students apply prior knowledge from Unit 3 by using absolute value to determine the distance between integers on the coordinate plane in order to find side lengths of polygons. Then they move to Lesson 8, where students draw polygons in the coordinate plane when given coordinates for vertices. They find the area enclosed by a polygon by composing and decomposing, using polygons with known area formulas. They name coordinates that define a polygon with specific properties. In Lesson 9, students find the perimeter of rectilinear figures using coordinates to find the lenghth of a side joining points with the same first coordinate or the same second coordinate. They continue to find the area enclosed by a polygon on the coordinate plane by composition and decomposition. The topic	**6.G.3** Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.		• Students use absolute value to determine distance between integers on the coordinate plane in order to find side lengths of polygons. • Given coordinates for the vertices, students draw polygons in the coordinate plane. Students find the area enclosed by a polygon by composing or decomposing using polygons with known area formulas. • Students name coordinates that define a polygon with specific properties. • Students find the perimeter of irregular figures using coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate	Topic B Lessons 7-10 Notes: Combine lessons 7 and 8 in one day. Since Unit on operations on integers has been completed, kids will have a better understanding adding/subtracting integers. Important idea: distance is always a subtraction problem and that distance is always a positive measurement.	Mid Unit Assessment after Topic B

concludes with Lesson 10, where students apply their knowledge of distance, perimeter, and area to real-life contextual situations. Students learn more than a "key word reading" of contexts. They comprehend different problem contexts and apply concepts accordingly.			• Students determine distance, perimeter, and area in real-world contexts.		
In Topic C, students extend their understanding of the volume of a right rectangular prism with integer side lengths to right rectangular prisms with fractional side lengths. They apply the known volume formula V=lwh to find the the volume of these prisms and use correct volume units when writing the answer. Students explore the bases of right rectangular prisms and understand that any face can be the base. They find the area of the base first and then multiply by the height. They determine that two formulas can be used to find the volume of a right rectangular prism.	**6.G.A.2** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.	**MP.4** Model with mathematics. Models will be used to demonstrate why the area formulas for different quadrilaterals are accurate.	• Students extend their understanding of the volume of a right rectangular prism with integer side lengths to right rectangular prisms with fractional side lengths. They apply the formula V = lwh to find the volume of a right rectangular prism and use the correct volume units when writing the answer. • Students extend the volume formula for a right rectangular prism to the formula V = Area of base times height. They understand that any face can be the base.	Topic C Lessons 11-14 Notes: Lesson 11: Some activities go beyond the standard which includes finding the volume of a figure with fractional edge lengths and applying volume to real-life and mathematical situations. There is no need for students to be able to determine, "how many ½ x ½ x ½ inch cubes will fit in the figure?" Combine lessons 11 and 12. Use the models in lesson 11 of the reinforcement of the formula in lesson 12. Students should be able to determine volume by finding the area of the base times the height. Do lesson 11 and introduce content of lesson 12 on day 1 and then do the	

				station work for lesson 12 on day 2. Lessons 13 and 14 are about practice. Choose problems that your students need to work on.	
Topic D begins with students constructing three-dimensional figures through the use of nets in Lesson 15. They determine which nets make specific solid figures and also determine if nets can or cannot make a solid figure. Students use physical models and manipulatives to do actual constructions of three-dimensional figures with the nets. Then, students move to constructing nets of three-dimensional objects using the measurements of a solid's edges. Using this information, students will move from nets to determining the surface area of three-dimensional figures in Lesson 17. In Lesson 18, students determine that a right rectangular prism has six faces: top and bottom, front and back, and two sides. They determine that surface area is obtained by adding the areas of all the faces and develop the formula SA=2lw+2lh+2wh. They develop and apply the formula for the surface area of a cube as SA=6s^2.	**6.G.2** Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. **6.G.4** Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.	**MP.6** Attend to precision. Students will understand and use labels correctly throughout the Unit.	• Students develop, understand, and apply formulas for finding the volume of right rectangular prisms and cubes. • Students understand that volume is additive and apply volume formulas to determine the volume of composite solid figures in real-world contexts. • Students apply volume formulas to find missing volumes and missing dimensions. • Students construct three-dimensional figures through the use of nets. They determine which nets make specific solid figures and determine if nets can or cannot make a solid figure. • Students construct nets of three-dimensional objects using the measurements of a solid's edges. • Students use nets to determine the surface area of three-dimensional figures. • Students determine that a right rectangular prism has six faces: top and bottom, front and back,	Topic D Lessons 15-19 Notes: Combine lessons 17 and 18 into one day. No need to do Lesson 19a unless you have extra time.	End of Unit Assessment after Topic D

			and two sides. They determine that surface area is obtained by adding the areas of all the faces and develop the formula SA = 2lw + 2lh + 2wh. • Students develop and apply the formula for the surface area of a cube as SA = 6s2.		

Unit 6 – Statistics
16 days (including assessments)

In this unit, students move from simply representing data into analysis of data. Students begin to think and reason statistically, first by recognizing a statistical question as one that can be answered by collecting data. Students learn that the data collected to answer a statistical question has a distribution that is often summarized in terms of center, variability, and shape. Throughout the Unit, students see and represent data distributions using dot plots and histograms. They study quantitative ways to summarize numerical data sets in relation to their context and to the shape of the distribution. As the unit ends, students synthesize what they have learned as they connect the graphical, verbal, and numerical summaries to each other within situational contexts, culminating with a major project.

Anchor Task:
Grade 6, Unit 6, Mid-Unit Assessment #2a-b

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
In Topic A, statistical questions are introduced in the context of a four-step process for posing and answering questions based on data. As students begin to explore data, they see the need to organize and summarize data. In Lesson 2, students are introduced to the idea that a data distribution can be represented graphically and that there are several different types of graphs, including dot plots and histograms, commonly used to represent a distribution of numerical data. This lesson then builds on students' previous work with line plots, introducing them to dot plots. In Lesson 3, students construct dot plots and begin to describe data distributions. In Lesson 4, students are introduced to histograms as another way of representing a data distribution graphically and the advantages and disadvantages of histograms relative to dot plots are discussed.	**6.SP.1** Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages. **6.SP.2** Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape. **6.SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **6.SP.5b** Summarize numerical data sets in relation to their context, such as by: **b.** Describing the nature of the attribute under investigation, including how it was measured and its units	**MP.1** Make sense of problems and persevere in solving them. Students make sense of problems by defining them in terms of a statistical question and then determining what data might be collected in order to provide an answer to the question and therefore a solution to the problem. **MP.2** Reason abstractly and quantitatively. Students pose statistical questions and reason about how to collect and interpret data in order to answer these questions. Students use graphs to summarize the data and to answer statistical questions.	• Students formulate a statistical question and explain what data could be collected to answer the question. • Students distinguish between categorical data and numerical data. • Given a dot plot, students begin describing the distribution of the points on the dot plot in terms of center and variability. • Students create a dot plot of a given data set. • Students summarize a given data set using equal length intervals and construct a frequency table. • Based on a frequency table, students describe the distribution. • Students construct a frequency histogram. • Students recognize that the number of intervals may affect the shape of a histogram. • Students recognize that the shape of a histogram does not change when relative frequency is used compared to when frequency is used to construct the histogram.	Topic A Lessons 1-5 Notes: Complete these lessons in 3 days. Each topic will need 3 days to complete. There are two extra days to reinforce as needed.	

	of measurement.				
In Topic B, students begin to summarize data distributions numerically. In Topic A, students have represented data distributions graphically and have described distributions informally in terms of shape, center, and variability. In this topic, students are introduced to a measure of center (the mean) and a measure of variability (the mean absolute deviation (MAD)) that are appropriate for describing data distributions that are approximately symmetric.	**6.SP.2** Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape. **6.SP.3** Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. **6.SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **6.SP.5** Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. **b.** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **c.** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.	**MP.3** Construct viable arguments and critique the reasoning of others. Students examine the shape, center, and variability of a data distribution. They communicate the answer to a statistical question in the form of a poster presentation. Students also have an opportunity to critique poster presentations made by other students.	• Students define the center of a data distribution by a "fair share" value called the mean. • Students connect the "fair share" concept with a mathematical formula for finding the mean. • Students understand that the mean is a balance point by calculating the distances of the data points from the mean and call the distances, deviations. • Students understand that the mean is the value such that the sum of the deviations is equal to zero. • Students see that a data distribution is not characterized only by its center. Its spread or variability must be considered as well. • Students use dot plots to order distributions according to the variability around the mean for each of the data distributions. • Students calculate the mean absolute deviation (MAD) for a given data set. • Students interpret the MAD as the average distance of data values from the mean. • Students use the mean and MAD to describe a data distribution in terms of center and variability.	Topic B Lessons 6-11 Notes: Complete these lessons in 3 days.	Mid Unit Assessment after Topic B

	d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.				
In Topic C, students are introduced to a measure of center (the median) and a measure of variability (the interquartile range (IQR)) that are appropriate for describing data distributions that are skewed. Box plots are also introduced in this topic.	**6.SP.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **6.SP.5** Summarize numerical data sets in relation to their context, such as by: **a.** Reporting the number of observations. **b.** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **c.** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. **d.** Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	**MP.4** Model with mathematics. Students create graphs of data distributions. They select an appropriate measure of center to describe a typical data value for a given data distribution. They also calculate and interpret an appropriate measure of variability based on the shape of the data distribution.	• Given a data set, students calculate the median of the data. • Students estimate the percent of values above and below the median value. • Students describe the variability in the data by calculating the interquartile range. • Students construct a box plot from a given set of data. • Given a box plot, students summarize the data by the 5-number summary (Min, Q1, Median, Q3, Max.) • Students describe a set of data using the 5-number summary and the interquartile range. • Students use box plots to compare two data distributions.	Topic C Lessons 12-16 Notes: Complete in 3 days.	
In Topic D, students integrate what they have learned about graphical and numerical data summaries in the previous topics. They match dot plots and histograms to numerical	**6.SP.B.4** Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **6.SP.B.5** Summarize numerical data sets in	**MP.6 Attend to precision.** Students interpret and communicate conclusions in context based on	• Given a statistical question, students use data to construct appropriate graphical and numerical summaries. • Students use graphical and numerical summaries to answer a	Topic D Lessons 17-22 Notes:	End of Unit Assessment after Topic D

measures of center and variability. Students estimate means and medians from graphical representations of data distributions. They also estimate mean absolute deviation (MAD) and interquartile range (IQR) from graphical representations based on an understanding of data distributions in terms of shape, center, and variability.	relation to their context, such as by: **a.** Reporting the number of observations. **b.** Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **c.** Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. **d.** Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.	graphical and numerical data summaries. Students use statistical terminology appropriately.	statistical question. • Students match the graphical representations and numerical summaries of a distribution. Matches involve dot plots, histograms, and summary statistics. • Given box plots of at least two data sets, students will comment on similarities and differences in the distributions. • Given a frequency histogram, students are able to describe the data collected, including the number of responses, an estimate of the mean or median, and an estimate of the interquartile range (IQR) or the mean absolute deviation (MAD). • Given a data set, students are able to describe the data collected, including the number of responses, mean or median, and the MAD or the interquartile range (IQR). • Based on the data collected by students or on a sample set of data (for cases in which collecting data was not possible), students communicate conclusions based on the data distribution.	Complete in 3 days.	

Unit 7 (7th grade Unit 5) – Statistics and Probability
15 days (Post SBAC)

Note for Unit 7 (Statistics and Probability): There are 24 days of lessons planned for this Unit; however, a couple lessons can be merged to be taught in 1 day. This will be teacher discretion based on the ability of your students.

In this unit, students begin their study of probability, learning how to interpret probabilities and how to compute probabilities in simple settings. They also learn how to estimate probabilities empirically. Probability provides a foundation for the inferential reasoning developed in the second half of this Unit. Additionally, students build on their knowledge of data distributions that they studied in Grade 6, compare data distributions of two or more populations, and are introduced to the idea of drawing informal inferences based on data from random samples.

Anchor Task:

7th Grade Unit 5 Exercise #3

Big Ideas	Common Core State Standards	Standards for Mathematical Practice	Objectives	Engage Lessons	Assessments
In Topic A, students begin a study of basic probability concepts (7.SP.5). They are introduced to the idea of a chance experiment and how probability is a measure of how likely it is that an event will occur. Working with spinners and other chance experiments, students estimate probabilities of outcomes (7.SP.6).	**7.SP.5** Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. **7.SP.6** Approximate the probability of a chance event by collecting data on the chance process that produces it and observing is long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly	**MP.2** Reason abstractly and quantitatively. Students reason quantitatively by posing statistical questions about variables and the relationship between variables. Students reason abstractly about chance experiments in analyzing possible outcomes and designing simulations to estimate probabilities. **MP.3** Construct viable arguments and critique the reasoning of others. Students construct viable arguments by using sample data to explore conjectures about a population. Students critique the reasoning of other students as part of poster or similar presentations.	• Students understand that a probability is a number between 0 and 1 that represents the likelihood that an event will occur. • Students interpret a probability as the proportion of the time that an event occurs when a chance experiment is repeated many times. • Students use given data to estimate probabilities. • Given a description of a simple chance experiment, students determine the sample space for the experiment. • Students distinguish between chance experiments with equally likely outcomes and chance experiments	Different buildings will have different amounts of time Post SBAC testing. Check 7th grade claims to help guide instruction for the end of the year. Communicate to your 7th grade teammates how much of this unit was completed to guide their planning for the following year. Topic A Lessons 1-7 Notes: None	

	200 times. **7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy. **a.** Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **b.** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?		for which the outcomes are not equally likely. • Students will calculate probabilities of events for chance experiments that have equally likely outcomes. • Given a description of a chance experiment that can be thought of as being performed in two or more stages, students use tree diagrams to organize and represent the outcomes in the sample space. • Students calculate probabilities of compound events.		
In Topic B, students estimate probabilities empirically and by using simulation. In Lesson 8, students make the distinction between a theoretical probability and an estimated probability. For a	**7.SP.7** Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible	**MP.4** Model with mathematics. Students use probability models to describe outcomes of chance experiments. They evaluate probability models by calculating the	• Given theoretical probabilities based on a chance experiment, students describe what they expect to see when they	Topic B Lessons 8-12	Mid-Unit Assessment after Topic B

simple chance experiment, students carry out the experiment many times and use observed frequencies to estimate known theoretical probabilities. Students also consider chance experiments for which they cannot compute theoretical probabilities. In Lesson 9, students continue to collect data from a chance experiment and use it to estimate probabilities. Students compare these probabilities to theoretical probabilities from a model and then assess the plausibility of the model. In Lessons 10 and 11, students work with simulations. They are either given results from a simulation to approximate a probability (Lesson 10), or they design their own simulation, carry out the simulation, and use the simulation results to approximate a probability (Lesson 11). Lesson 12 concludes this topic by providing students with opportunities to use probabilities to make decisions.	sources of the discrepancy. **a.** Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected. **b.** Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies? **7.SP.8c** Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **c.** Design and use a simulation to generate frequencies for compound events. For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at	theoretical probabilities of chance events, and by comparing these probabilities to observed relative frequencies. **MP.5** Use appropriate tools strategically. Students use simulation to approximate probabilities. Students use appropriate technology to calculate measures of center and variability. Students use graphical displays to visually represent distributions.	observe many outcomes of the experiment. • Students distinguish between theoretical probabilities and estimated probabilities. • Students understand that probabilities can be estimated based on observing outcomes of a chance experiment. • Students compare estimated probabilities to those predicted by a probability model. • Students learn how to perform simulations to estimate probabilities. • Students use various devices to perform simulations (e.g., coin, number cube, cards). • Students design their own simulations. • Students learn to use two more devices in simulations: colored disks and a random number table. • Students will use estimated probabilities to	Notes: Acquire materials needed for these lessons ahead of time (cups, marbles, etc.).	

	least 4 donors to find one with type A blood?		judge whether a given probability model is plausible. • Students will use estimated probabilities to make informed decisions.		
Topic C begins developing the concept of generalizing from a sample to a larger population. In Lesson 13, students are introduced to the following terminology: population, sample, population characteristic, and sample statistic. Students distinguish between the population and a sample and between a population characteristic and a sample statistic as they investigate statistical questions. In Lesson 14, students learn the importance of random sampling and of using a random mechanism in the sample selection process. In Lesson 15, students select a random sample from a population and begin to develop an understanding of sampling variability. In Lesson 16, students develop a plan for selecting a random sample from a specified population. Students see a more formal introduction to "sampling variability" in Lesson 17, where several samples are randomly selected from the sample population. They compute sample means and use	**7.SP.1** Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. **7.SP.2** Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated sample) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.	**MP.6** Attend to precision. Students interpret and communicate conclusions in context based on graphical and numerical data summaries. Students make appropriate use of statistical terminology.	• Students understand that how a sample is selected is important if the goal is to generalize from the sample to a larger population. • Students understand that random selection from a population tends to produce samples that are representative of the population. • Students begin to develop an understanding of sampling variability. • Given a description of a population, students design a plan for selecting a random sample from that population. • Students use data from a random sample to estimate a population mean. • Students understand the	Topic C Lessons 13-20 Notes: None	

collected data to develop a sense of variation in the values of a sample mean and an understanding of how this variability is related to the size of a sample. In Lesson 18, students use data from a sample to estimate a population mean. In Lesson 19, they develop an understanding of the term sampling variability in the context of estimating a population mean. In Lesson 20, they estimate a population proportion using categorical data from a random sample.			term "sampling variability" in the context of estimating a population mean. • Students know that increasing the sample size decreases the sampling variability of the sample mean. • Students understand the term sampling variability in the context of estimating a population proportion. • Students know that increasing the sample size decreases sampling variability. • Students use data from a random sample to estimate a population proportion.		
In Topic D, students learn to compare two populations with similar variability. They learn to consider sampling variability when deciding if there is evidence that population means or population proportions are actually different. In Lesson 21, students work with random samples from two different populations that have similar variability. They	**7.SP.3** Informally assess the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the		• Students use data from random samples to draw informal inferences about the difference in population means. • Students express the difference in sample means as a multiple of a measure of variability. • Students understand that a difference in	Topic D Lessons 21-23 Notes:	End of Unit Assessment

decide if there is "evidence" that the means of the two populations are actually different. In Lesson 22, students describe the difference in sample means from populations with similar variability by using a multiple of the measure of variability. They explore how big the difference in sample means would need to be in order to indicate a difference in population means. This lesson sets the stage for drawing informal conclusions about the difference between two populations' means from populations with similar variability. Lesson 23, again, uses random samples to draw informal inferences about the differences in means of two populations. Students work with examples in which there is a meaningful difference in population means and also with examples in which there is no evidence of a meaningful difference in population means.	variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable. **7.SP.4** Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.		sample means provides evidence that the population means are different if the difference is larger than what would be expected as a result of sampling variability alone. • Students understand that a meaningful difference between two sample means is one that is greater than would have been expected due to just sampling variability.	None	